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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/826,366	04/19/2004	Hiroshi Sera	119209	1035

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EXAMINER
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RODGERS, COLLEEN E

ART UNIT	PAPER NUMBER
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2813

DATE MAILED: 01/10/2006

Please find below and/or attached an Office communication concerning this application or proceeding.

## Office Action Summary

Application No.

10/826,366

Applicant(s)

SERA, HIROSHI

Examiner

Colleen E. Rodgers

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– The MAILING DATE of this communication appears on the cover sheet with the correspondence address –  
Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

### Status

- 1) ☒ Responsive to communication(s) filed on 03 November 2005.  
2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.  
3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

### Disposition of Claims

- 4) ☒ Claim(s) 1-12 is/are pending in the application.  
4a) Of the above claim(s) \_\_\_\_\_ is/are withdrawn from consideration.  
5) ☐ Claim(s) \_\_\_\_\_ is/are allowed.  
6) ☒ Claim(s) 1-12 is/are rejected.  
7) ☒ Claim(s) 1 is/are objected to.  
8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

### Application Papers

- 9) ☐ The specification is objected to by the Examiner.  
10) ☒ The drawing(s) filed on 19 April 2004 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.  
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).  
11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

### Priority under 35 U.S.C. § 119

- 12) ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).  
a) ☒ All b) ☐ Some \* c) ☐ None of:  
1. ☒ Certified copies of the priority documents have been received.  
2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.  
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

\* See the attached detailed Office action for a list of the certified copies not received.

### Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892)  
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)  
3) ☒ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)  
Paper No(s)/Mail Date 4/19/04.  
4) ☐ Interview Summary (PTO-413)  
Paper No(s)/Mail Date. \_\_\_\_\_.  
5) ☐ Notice of Informal Patent Application (PTO-152)  
6) ☐ Other: \_\_\_\_\_.

## DETAILED ACTION

### *Election/Restrictions*

1. Applicant's arguments are persuasive. Therefore, the restriction requirement of 4 October 2005 is hereby withdrawn. Claims 9, 11 and 12 are hereby fully examined for patentability.

### *Claim Objections*

2. Claim 1 is objected to because of the following informalities: in line 15, replace "one of layer of the layered insulating film" with --one of the layers of the layered insulating film-- for clarity. Appropriate correction is required.

### *Claim Rejections - 35 USC § 112*

3. The following is a quotation of the second paragraph of 35 U.S.C. 112:

The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

4. Claim 5 is rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

Regarding claim 5, it is unclear to which insulating film it is referred in line 3 ("...controls a volume of the insulating film ..."). It could be either the uppermost insulating film or the layered insulating film, both of which have been referred to previously in the claim. Furthermore, also in line 3, it is unclear what the metes and bounds of "a vicinity" are.

***Claim Rejections - 35 USC § 102***

5. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

6. Claims 1, 2, 3, 5, 6 and 9-12 are rejected under 35 U.S.C. 102(b) as being anticipated by **Chen et al** (US Patent Application Publication 2002/0145142).

Regarding claims 1 and 10, **Chen et al** teaches a method of forming a thin-film semiconductor device, the method including the steps of:

forming a semiconductor film **32** with a predetermined pattern on a substrate **30**;

forming a gate-insulating film **34** on the semiconductor film **32**;

forming a tapered gate electrode **36** [see paragraph 0019, wherein it is noted that the gate electrode may be trapezoidal rather than rectangular] on the gate-insulating film **34**;

implanting a low concentration of impurity into the substrate **30** through the gate electrode **36** functioning as a mask [see paragraph 0020];

forming a layer insulating film composed of at least two different insulating films **40**, **42** on the gate electrode **36** on the substrate **30**;

etching an entire surface of the layered insulating film to form a predetermined pattern in at least one layer **42** of the layered insulating film, the predetermined pattern having a width greater than a width of the gate electrode **36** and smaller than a width of the substrate **30** [see Fig. 2D]; and

implanting a high concentration of impurity through the layered insulating film formed according to a predetermined pattern functioning as a mask [see paragraph 0021].

Regarding claim 2, **Chen et al** discloses the method of claim 1 as described above, wherein the uppermost layer 42 of the layered insulating film is isotropically formed and anisotropically etched [see Figs. 2C and 2D].

Regarding claim 3, **Chen et al** discloses the method of claim 2 as described above, wherein anisotropic etching is performed after the formation of the predetermined pattern as shown in Fig. 2D, the predetermined pattern having a width greater than the width of the gate electrode 36 and smaller than the width of the semiconductor film 32 [see Fig. 2E].

Regarding claim 5, **Chen et al** discloses the method of claim 1 as described above, wherein the endpoint of etching for the uppermost layer 42 of the layered insulating film controls the volume of the insulating film remaining in the vicinity of the gate electrode 36. As best understood, this is inherent to the process of etching. The endpoint of etching will always determine the amount of material left unetched.

Regarding claim 6, **Chen et al** discloses the method of claim 1 as described above, wherein the etching rate of the upper insulating layer is greater than the etching rate of the lower insulating layer in the first, dry-etching process (etch-selective to the uppermost insulating layer), and the etching rate of the exposed lower insulating layer is greater than the etching rate of the remaining upper insulating layer in the second, wet-etching process (etch-selective to the lower insulating layer). As best understood, it is inherent that in a process utilizing two etch steps, etch selectivity is practiced to control which material is etched by each process.

Regarding claims 9 and 11, **Chen et al** discloses the method of claims 1 and 10 as described above. **Chen et al** furthermore discloses that the insulating film 46 is formed at least along the sides of the gate electrode 36 [see Figs. 2C-2F], and each of the source region and the drain region 48 of

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the semiconductor 32 have a low-concentration region 38 corresponding to a portion of the insulating film 46 with a width greater than the width of the gate electrode 36 [see Fig. 2F].

Regarding claim 12, **Chen et al** discloses the method of claim 11 as described above, wherein the resulting electro-optic apparatus may be included in an LCD display, which is an electronic apparatus [see paragraph 0004].

### ***Claim Rejections - 35 USC § 103***

7. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

8. Claims 4, 7 and 8 are rejected under 35 U.S.C. 103(a) as being unpatentable over **Chen et al** (US Patent Application Publication 2002/0145142 A1) in view of **Tsubone** (USPN 5,100,820).

Regarding claims 4, the prior art **Chen et al** discloses the method of claim 1 as described above. **Chen et al** does not disclose what material is used to form the gate-insulating layer 34; therefore, **Chen et al** does not disclose that the uppermost insulating layer and the gate-insulating layer have substantially the same composition. **Tsubone** teaches substantially the method of **Chen et al** with the exception of the semiconductor layer. Furthermore, **Tsubone** teaches that the gate-insulating film 53 and the uppermost insulating layer 60 of the layered insulating film have substantially the same composition [see col. 7, lines 61-68 and col. 8, lines 64-66]. It would have been obvious to one of ordinary skill in the art at the time of invention to use the materials of

**Tsubone** in the method of **Chen et al** because the materials of **Tsubone** are art-recognized materials for use in insulating layers.

Regarding claim 7, the prior art **Chen et al** discloses the method of claim 1 as described above. **Chen et al** does not disclose that the gate-insulating film is composed of silicon oxide. **Tsubone** teaches substantially the method of **Chen et al** with the exception of the semiconductor layer. Furthermore, **Tsubone** teaches that the gate-insulating film is composed of silicon oxide [see col. 7, lines 61-68]. It would have been obvious to one of ordinary skill in the art at the time of invention to use the materials of **Tsubone** in the method of **Chen et al** because silicon oxide is an art-recognized material for use in insulating layers.

Regarding claim 8, the prior art **Chen et al** discloses the method of claim 1 as described above. **Chen et al** does not disclose that the first insulating layer is silicon nitride and the second insulating layer is silicon oxide. **Tsubone** teaches substantially the method of **Chen et al** with the exception of the semiconductor layer. Furthermore, **Tsubone** teaches that the first insulating layer 56 is silicon nitride [see col. 8, lines 10-15] and the second insulating layer 60 is silicon oxide [see col. 8, lines 64-66]. It would have been obvious to one of ordinary skill in the art at the time of invention to use the materials of **Tsubone** in the method of **Chen et al** because silicon oxide and silicon nitride are art-recognized materials for use in insulating layers.

### *Conclusion*

9. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure. **Ishida et al** discloses a method of forming a thin-film device with a tapered gate electrode whereby the gate electrode is etched back between dopant implantation steps.


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Any inquiry concerning this communication or earlier communications from the examiner should be directed to Colleen E. Rodgers whose telephone number is (571) 272-8603. The examiner can normally be reached on Monday through Friday, 7:30 AM to 4:00 PM.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Carl Whitehead can be reached on (571) 272-1702. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

CER

  
GEORGE ECKERT  
PRIMARY EXAMINER